Remarks

Status of the Claims

Claims 1 – 20 were original in the application. Claim 20 has been withdrawn. Claims 1 – 4, 18, and 19 have been cancelled. Claims 5, 6, 9 -14, and 16 have been amended. Claims 11 – 17 were indicated as allowable if rewritten in independent form. Therefore, claims 5 – 10 are submitted for examination on the merits and claims 11 – 17 for allowance.

Specification

The disclosure is objected to because of the following informalities: The blank spaces referring to the patent numbers and grant dates of the copending applications on pages 5 and 7 have been corrected.

Claim Rejections - 35 *USC* § 112

Claims 1 - 19 were rejected as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 has been appropriately amended to remove the clerical error.

Claim Rejections - 35 *USC* § *102*

Claims 6 - 8, 18 and 19 were rejected as being anticipated by **Hollis *et al.*** U.S. Patent 5,653,939.

In regard to claim 6, the Examiner contended that **Hollis** teaches that the

micro fluidic flow system comprising: an electro-deformable membrane *(e.g.,* membrane actuator layer 344 comprising a PVDF polymer; a substrate (341) disposed below the membrane and coupled thereto, wherein a microchannel *(e.g.,* 342 & 343), which has a longitudinal axis, is defined between the membrane and the substrate; and a metal electrode structure disposed on at least one side of the membrane along side of the microchannel (see co!. 14, lines 49 - 67; co!. 15, lines 1-14; figure 19).

What **Hollis** actually teaches beginning at col. 14, line 33, in regard to the peristaltic pump is very little, namely:

> "Referring now to FIGS. 18 and 19, a microfluidic system for synthesizing unique genosensor probes in situ in a test site will now be described. In this embodiment, reagent sources 352 are individually fluidly coupled via channels L1, L2 - - - LN to respective microchannel valves V1,V2 - - - VN formed in a suitable substrate 341. Valves V1-VN enable flow of solution into manifold line L4. **Microfluidic peristaltic pump P1** forces the solution onto array 10', which is enclosed by laser-radiation-permeable films 344 and 343, such as silicon nitride or silicon dioxide.
>
> .
> .
> .
>
> "The microfluidic flow system depicted in FIG. 19 can be formed as follows. A photoresist material is spin-coated on a substrate 341, formed, for example of pyrex glass. The microchannel structure is then patterned into the photoresist using standard photolithography and the pattern, including channel structures 343 and 342, are transferred into the substrate by etching using buffered HF. **A membrane actuator layer 344, comprised of preferably a piezoelectric, such as lead zirconium titanate or PVDF polymer and metal electrodes, is then bonded to the microchannel structure.** During sensitization the array 10' is sealed against the microfluidic system preferably using an elastomer O-ring 345. Alternate membrane actuator layers, known to specialists in the art, make use of shaped memory alloys rather than piezoelectrics, or are based on passive materials deformed electrostatically, for example, aluminum films which are deflected by DC voltages applied to **electrodes (not shown)**."

There is no teaching in the foregoing of an electrode structure disposed on

at least one side of the membrane along side of the microchannel as set out in claim 6. In fact, there is no teaching whatsoever of any structural aspect of the membrane electrodes in **Hollis**. It thus cannot be sustained that **Hollis** teaches each and every element of claim 6.

In regard to claim 7, as shown in figure 19, the Examiner contended that the electro-deformable membrane (344) is bowed to form a curvature having a symmetrical axis in the direction of the longitudinal axis of the microchannel (342 & 343).

The teaching of **Hollis** in regard to actuator layer 344 is nearly nil. **Hollis** states at col. 14, line 64:

> "A **membrane actuator layer 344**, comprised of preferably a piezoelectric, such as lead zirconium titanate or PVDF polymer and metal electrodes, is then bonded to the microchannel structure."

Hollis is totally silent in regard to any curvature of membrane layer 344 and what is shown in Fig. 19 is a curvature which has an axis of symmetry, if at all, perpendicular to the microchannel 342. Actually, no axis of symmetry for layer 344 is shown or discussed as existing or extending in any direction. It thus cannot be sustained that **Hollis** teaches each and every element of claim 7.

In regard to claim 8, the Examiner contended that **Hollis** teaches that the membrane actuator membrane layer 34 is deformed electrostatically due to the application of DC voltage (see col. 15, lines 2 – 6).

While the Examiner is correct in noting that electrostatic actuation of membrane layers is known, claim 8 calls for a drive circuit coupled to the electrode structure to apply a sequential voltage along the plurality of opposing

electrodes to peristaltically deform the electro-deformable membrane in the direction of the longitudinal axis of the microchannel. Electrostatic actuation is not explicitly mentioned and what is instead defined is a *drive circuit* coupled to the *electrode structure* to apply a sequential voltage along *the plurality of opposing electrodes,* none of which structures are shown or described in **Hollis**. It thus cannot be sustained that **Hollis** teaches each and every element of claim 8.

Claim Rejections - 35 *USC* § *103*

Claim 5 was rejected as being obvious over **Hollis** in view of **Thomas *et al.*** US. Patent 6,444,474. The Examiner contended that the recitation that the integrated LED and integrated optical detector are tuned to an optical absorption line of an analyte is considered a functional limitation.

Where in claim 5 it is recited that an integrated LED and integrated optical detector are tuned to an optical absorption line of said analyte, it is a definition of the structural parameters which go to the make up or configuration of the device. Optical devices are "tuned" not so much by how they operate, but by virtue of their structural parameters which define and limit their operation. To tune an optical system to a different frequency would necessitate making structural changes in the device and not merely operating the same device differently. Functional definition of a means is dictated as the statutory manner by which a structural means is defined in 35 USC 112.

Claims 9 and 10 were rejected as being obvious over **Hollis** in view of

Mouri US. Patent 6,495,852. The Examiner admitted that **Hollis** does not specifically teach the incorporation an electrodeformable membrane comprised of p-type GaN, but contended that **Hollis** teaches that the membrane actuator layer (344) comprising the electrodeformable membrane is comprised of a piezoelectric material (see col. 14, lines 57 - 66). The Examiner contended that **Mouri** teaches that gallium nitride materials generally have a large piezoelectric constant (see col. 4, lines 1 - 63). Therefore, the Examiner asserted that it would have been obvious to incorporate an electrode formable membrane comprised of p-type GaN.

Again, it must be carefully first considered what Mouri teaches in regard to the piezoelectric nature of GaN:

> 'In general, a **gallium nitride group compound semiconductor material** has a large piezoelectric constant. In the multilayer structure as shown in FIG. 1 including the InGaN layers and the GaN layers, a difference in the lattice constant between an InGaN layer and a GaN layer causes a large compressive strain which is applied to the InGaN layer. A large internal electric field (piezoelectric field) is generated due to a piezoelectric effect caused by the compressive strain. The direction of the internal electric field thus generated is opposite to that of an electric field caused by a pn junction. As described above, in this invention, the photosensitivity is improved using the internal electric field (piezoelectric field) generated by the piezoelectric effect."

There is no teaching or suggestion in **Mouri** that GaN would be a suitable material for a membrane in a peristaltic pump. **Mouri** only mentions an InGaN layer junction with a GaN layer as improving photosensitivity in a photodetector, a device quite unlike a peristaltic pump. No gallium nitride junction is being taught has being used for a membrane in the claim, but instead composing the membrane of GaN without multilayer any junction.

Advancement of the claims as amended to allowance is respectfully requested.

Respectfully submitted,

Daniel L. Dawes
Reg. No. 27123
949 223 9600
949 223 9610 fax

Mailing Address:
19900 MacArthur Blvd, Ste 1150
Irvine, California 92612